

REMARKS/ARGUMENTS

Claims 1, 3-8, 10, 12 and 14 are canceled. The pending claims are claims 2, 9, 11 and 13. Claim 2 has been amended to include the limitations stated in canceled claim 5. The specification and claim 9 have been amended to properly recite "alkaline earth metals". No new matter was added. Arguments are presented to overcome the rejections of the claims based on the cited prior art. Accordingly, Applicants respectfully submit that the present application is in condition for allowance.

Claim Rejections Under 35 USC § 112, second paragraph

In the Office Action, the Examiner rejected claim 9 as being indefinite for failing to particularly point out and distinctly claim the subject matter Applicants regard as the invention. To this end, the Examiner objected to the phrases "alkali earth metals", "heavy metals" and "light metals".

The specification and claim 9 has been amended to replace the phrase "alkali earth metals" with the phrase "alkaline earth metals". This is simply to correct a typographical error made when the application was translated from Japanese to English. A copy of a page of a typical Chemistry textbook is attached to this Amendment and identifies "alkali metals" as being Group IA metals and "alkaline earth metals" as being Group IIA metals. No new matter was added.

In addition, selected pages of The Van Nostrand Chemist's Dictionary, published by D. Van Nostrand Company, Inc. in 1953, are also attached to this Amendment and provide standard dictionary definitions for the phrases "light metals" and "heavy metals". To this end, "light metals" are defined as a "metallic element ... with a density below four", and "heavy metals" are defined as "a metal having a specific gravity greater than four."

Applicants respectfully submit that claim 9 fully complies with 35 USC § 112, second paragraph. Reconsideration and removal of the rejection is respectfully requested.

Claim Rejections under 35 USC §103(a)

In the Office Action, the Examiner rejected claims 2 and 9 under 35 USC §103(a) as being obvious in view of U.S. Patent No. 6,309,595 issued to Rosenberg et al. and U.S. Patent No. 4,891,066 issued to Shimotori et al..

The Examiner states that the Rosenberg and Shimotori patents disclose titanium materials having oxygen contents of less than 50 ppm and between 20 to 100 ppm, respectively.

Claim 2 of the present application requires a titanium sputtering target having an impurity concentration of gas components including oxygen, nitrogen and hydrogen of 20ppm or less and a Vickers hardness (Vs) of 120 or less. Applicants submit that the Rosenberg and Shimotori patents each fail to disclose the required “gas components” impurity concentration and the required hardness.

Claim 2 of the present application requires a total gas component impurity concentration to be 20ppm or less. The gas components as defined by the claim includes the total of oxygen, nitrogen and hydrogen (not just oxygen). For example, the Shimotori patent discloses a minimum oxygen content of 20ppm. Thus, its gas component impurity concentration would clearly be above 20ppm due to the presence of nitrogen and hydrogen gas components. Thus, the Shimotori patent clearly fails to disclose the claimed limitation. Likewise, the Rosenberg patent also fails to disclose a total gas component impurity concentration of 20ppm or less. A disclosure of 50ppm or less of oxygen, alone, does not disclose the claimed limitation which relates to total gas component impurities.

Further, the present application teaches that the Vickers hardness (Vs) of “an ordinary high-purity titanium target is 150”. (See page 6, lines 19-20, of the present application as filed.) In addition, the present application teaches that a Vickers hardness (Vs) of 120 or less can only be obtained with respect to a high-purity titanium target when the target has total “gas component” impurities of 20ppm or less. (See page 6, lines 16-18, of the present application as filed.) Of course, “gas component” impurities are the total of all gas components including oxygen, nitrogen and hydrogen (not just oxygen).

Thus, for the above stated reasons, the Rosenberg and Shimotori patents fail to disclose, suggest or teach a titanium sputtering target having a total gas component impurity (including the total of oxygen, nitrogen and hydrogen) of 20ppm or less and a Vickers hardness (Vs) of 120 or less. Thus, the compositions disclosed by the Rosenberg and Shimotori patents are not the same, nor overlap, that claimed by claim 2 of the present application.

For these reasons, Applicants respectfully submit that claims 2 and 9 are patentable and are not obvious in view of either the Rosenberg or Shimotori patents. Reconsideration and removal of the rejection is respectfully requested.

In the Office Action, the Examiner also rejected claims 11 and 13 under 35 USC §103(a) as being obvious in view of U.S. Patent No. 6,309,595 issued to Rosenberg et al. or U.S. Patent No. 4,891,066 issued to Shimotori et al. in view of U.S. Patent No. 6,045,634 issued to Annavarapu.

Claims 11 and 13 of the present application require the target to have an average grain diameter of 20 μ m or less. Thus, in addition to requiring a titanium sputtering target having an impurity concentration of gas components including oxygen, nitrogen and hydrogen of

20ppm or less and a Vickers hardness (Vs) of 120 or less, the target also must have a required average grain diameter.

The present application, as filed, on page 6, lines 4-10, states:

“Conventionally, since there is an inclination for the grain diameter to become coarser when reducing the oxygen content, attempts were not made for precisely adjusting the two. Nevertheless, in the present invention, it was discovered that the reduction of oxygen content and the prevention of grain diameter coarsening are particularly effective in preventing the formation of particles.”

The prior art cited by the Examiner supports this position. To this end, the Examiner admits that the Rosenberg and Shimotori patents are silent with respect to grain size and clearly fail to disclose a target having an average grain diameter of $20\mu\text{m}$ or less. As stated above, this is because reducing oxygen content as taught by Rosenberg and Shimotori results in the coarsening of the grain diameter.

The Examiner cites the Annavarapu patent which discloses a sputtering target having a crystal grain size of less than $20\mu\text{m}$. Of course, the Annavarapu patent fails to disclose, suggest or teach a titanium sputtering target having a total gas component impurity (including the total of oxygen, nitrogen and hydrogen) of 20ppm or less and a Vickers hardness (Vs) of 120 or less.

The U.S. Court of Appeals for the Federal Circuit in In re Dembiczak, 50 USPQ2d 1614 (Fed. Cir. 1999) sets forth the requirements for a valid obviousness rejection based on 35 USC §103 for situations similar to that as presented in the present application. The Federal Circuit states, at 50 USPQ2d, 1616-1617, that:

“Our analysis begins in the text of section 103 quoted above, with the phrase ‘at the time the invention was made.’ For it is this phrase that guards against entry into the ‘tempting but forbidden zone of hindsight,’ ... when analyzing the patentability of claims pursuant to that section. Measuring a claimed invention against the standard established by section 103 requires the oft-difficult but critical step of casting the mind back to the time of the

invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. ...Close adherence to this methodology is especially important in the case of less technologically complex inventions, where the very ease with which the invention can be understood may prompt one 'to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher'... .

Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. ... Combining prior art references **without evidence** of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability - the essence of hindsight. ...”

There is clearly **no evidence** of a suggestion, teaching, or motivation **stated in the Rosenberg and/or Shimotori patents** to produce a target having a crystal grain size of less than $20\mu\text{m}$. In addition, there is clearly **no evidence** of a suggestion, teaching, or motivation **stated in the Annavarapu patent** to provide a titanium sputtering target having a total gas component impurity (including the total of oxygen, nitrogen and hydrogen) of 20ppm or less and a Vickers hardness (Vs) of 120 or less.

Rather, the only suggestion of producing a titanium sputtering target having: (A) a total gas component impurity (including the total of oxygen, nitrogen and hydrogen) of 20ppm or less; (B) a Vickers hardness (Vs) of 120 or less; and (C) a crystal grain size of less than $20\mu\text{m}$ is provided in the present application. Applicants respectfully submit that the rejections based on a combination of the above cited patents merely “takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability”. As such, Applicants' submit that such a rejection is improper as determined by the U.S. Court of Appeals for the Federal Circuit in In re Dembiczak.

For these reasons as well as the reasons previously stated, Applicants respectfully submit that claims 11 and 13 of the present application are patentable and non-obvious over the combination of the Rosenberg and Shimotori patents with the Annavarapu patent.

Reconsideration and removal of the §103(a) rejections of claims 2, 9, 11 and 13 is respectfully requested.

In view of the above amendments and remarks, Applicants respectfully submit that the rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
Howson and Howson
Attorneys for Applicants

By William Bak
William Bak
Reg. No. 37,277
Spring House Corporate Center
Box 457
Spring House, PA 19477
(215) 540-9216